PROBLEMS FOR SOLUTION.

ALGEBRA.

253. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

Prove that $x^5+ax+b=0$ is solvable by radicals if $b=ma$, m being the negative of half the sum of any two roots of the original equation. Exhibit the solution.

254. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

Sum to infinity the series $\dfrac{n^2}{(16n^2-1)^2}$ beginning with $n=1$.

255. Proposed by O. E. GLENN, Ph. D., Springfield, Mo.

Let f be the binary cubic $a_0x_1^3+3a_1x_1^2x_2+3a_2x_1x_1^2+a_3x_2^3$, $\triangle=(f,f)_2$ the covariant, the second transvectant of f over itself, and $R=2[4(a_0a_2-a_1^2)\times(a_1a_3-a_2^2)-(a_0a_3-a_1a_2)^2]=(\triangle,\triangle)_2$=the second transvectant of $\triangle$ over itself. Then if $\triangle_{\kappa\lambda}$ is the $\triangle$ covariant for the cubic pencil $\kappa f+\lambda Q$, Q being the first transvectant of f over $\triangle$ we have $\triangle_{\kappa\lambda}=(\kappa^2-\frac{1}{2}\lambda^2R)\triangle$.

CALCULUS.

900. Proposed by PROFESSOR B. F. FINKEL, A. M., 4038 Locust Street, Philadelphia, Pa.

Prove that, if the differential equation $cydx-(y+a+bx)dy-nx(xdy-ydx)=0$, be transformed into an equation between u and x by the substitution $u(y+a+bx+nx^2)=y(c+nx)$, then the variables are separable; and reduce the equation to the form $dv/\phi(v)=dx/\phi(x)$ by the further substitution $v=au+\beta$, a and β being suitably determined. *Euler.* [Forsyth's *Differential Equations*, p. 48, Ex. 4.]

DIOPHANTINE ANALYSIS.

132. Proposed by O. E. GLENN, Ph. D., Springfield, Mo.

Disregarding the order of λ, μ, ν, how many sets of solutions has the congruence $\lambda+\mu+\nu\equiv0 \pmod{p-1}$ (p prime)?

GEOMETRY.

280. Proposed by WILLIAM HOOVER, Ph. D., Athens, Ohio.

On any diameter of a given ellipse is taken a point such that the tangents from it intercept on the tangent at one end of the diameter a length equal to the diameter; the ellipse being $a^2y^2+b^2x^2-a^2b^2=0$. Prove that the locus of the point is $\left(\dfrac{x^2}{a^2}-\dfrac{y^2}{b^2}\right)^2=\left(\dfrac{a^2+b^2}{a^2-b^2}\right)^2\left(\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}\right)$.